Comparative Analysis of U.S. Federal Management to the FAO Ecolabelling Guidelines

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External Independent Peer Review Prepared for

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October 2014

Executive Summary

The NMFS has developed a document that lays out the degree to which the U.S. fisheries management meets the FAO 'Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Wild Capture Fisheries' in "Comparative Analysis of U.S. Federal Management to the FAO Ecolabelling Guidelines: A Self-assessment". Another document, "Framework Assessment of Sustainability: Methodology for Evaluating the Conformance of Fishery Management Systems to FAO's Guidelines for Ecolabelling", has been developed to explain the scoring and appraisal system that has been used to assess compliance of U.S. fisheries management with the FAO guidelines. In review of the FAO guidelines, NMFS consolidated apparent redundancies to produce and score 24 Topics of Pertinence.

The document contained a very thorough presentation of the extent to which U.S. law and fisheries management meet the requirements of the FAO guidelines. I found the *Internal Conformance* sections sufficiently complete that I was unable to improve upon them without having more time for review, and perhaps not even then. I did add to both the *Outcome* and *Independent Conformance* sections with information for recreational fisheries, additional pertinent National Academy Review reports, and academic studies. The document states that it covered federal management and, thus, did not include information from the regional fisheries commissions (RFCs). However, the RFCs regulate fisheries that cross state boundaries, enter the EEZ, and would be important for U.S. efforts at ecolabelling. Management of stocks by the RFCs is coordinated with NMFS and adds further credence to the document. Hence, I added information relevant to the RFCs in my analysis of the Topics of Pertinence.

In the cases where laws or management could be improved, some will prove more difficult. While there have been recent important developments in managing and modeling data-poor stocks, the effects of climate change on habitats, distributions, and productivity lags. In part, this is because of the political climate is more controversial on this topic than is the science, and because this is an area of relatively new research.

Background

In 1997 Unilever and the World Wide Fund for Nature established the Marine Stewardship Council (MSC) to develop a certification process for seafood that is well managed and sustainable. Fish products bearing the MSC label have gone through a scientific appraisal of their management and to hold a certification, they must be periodically reappraised. The value in having a certificate lies in growing appreciation among the public to limit their seafood purchases to only those that come from sustainable fisheries and who are willing to pay a premium for ecolabelled fish. The ability of United States fisheries to meet the FAO 'Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Wild Capture Fisheries' would not only provide ethical management practices, but might also increase the value of U.S. fisheries products.

The NMFS has developed a document that lays out the degree to which the U.S. fisheries management meets the FAO 'Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Wild Capture Fisheries' in "Comparative Analysis of U.S. Federal Management to the FAO Ecolabelling Guidelines: A Self-assessment". As such it is an important step in providing a framework for future ecolabelling of U.S. fisheries.

Description of the Individual Reviewer's Role in the Review Activities

My role as a CIE reviewer at was to participate in a desk review of the documents for the Comparative Analysis of U.S. Federal Fishery Management to the FAO Ecolabelling Guidelines during September 24 - October 8, 2014. Background documents were sent by email. I read and became familiar with the relevant documents provided to the panel by NMFS (Appendix 1) and literature relevant to the ecolabelling issue (Appendix 1). I asked for additional clarification to the Statement of Work because there were some discrepancies with the schedule and documents.

Summary of Findings for each ToR

ToR 1 –Generate a table (as described by Table 3 in Framework Assessment of Sustainability) documenting evidence of intention, performance, and independent verification of U.S. federal marine fishery management conformance.

i. In assessing intentions (i.e., internal evidence), the document of example statutes and regulations provided (in the pre-review background documents) may serve as the basis for conformance evidence. Additional legislative and regulatory evidence may also be provided per the reviewer's knowledge and expertise.

ii. In assessing performance (i.e., outcome evidence) and independent verification (i.e., independent evidence), examples shall be derived from the reviewer's knowledge and expertise of the U.S. federal marine fishery management system.

The main document, Comparative Analysis of U.S. Federal Fishery Management to the Ecolabelling Guidelines: Self-Assessment, provided a very detailed analysis of US law and policy and how these meet the FAO ecolabelling guidelines. I found that this document was extremely thorough and had done an excellent job in documenting the US fishery management system in light of the FAO documents. I found that I could not improve on the *Internal Evidence*, that the *Outcome Evidence* was very thorough, and the *Independent Evidence* largely complete and kept large sections in building Table 1. I did add to *Outcome Evidence* and *Independent Evidence* in regards to recreational fisheries, Regional Fisheries Commissions, the National Academy's National Research Council reports, and a few academic articles that enhance the NOAA analysis.

Although recreational fishing is not a major component of the largest U.S. fisheries, it can be important and even the largest component of several important fisheries such as striped bass

(*Morone saxatilis*), bluefish (*Pomatomus saltatrix*), and summer flounder (*Paralichthys dentatus*), among others. Whereas most of the 24 topics are generally applicable, recreationally fisheries have a different system of data collections (#6) – MRIP with a strong component of voluntary compliance; less reliance on MSY (#10) and more on higher CPUE and trophy-sized catches; more difficult issues of compliance via monitoring (#17) – MRIP on site survey and local law enforcement are responsible for monitoring and compliance of millions of anglers along the US coastline; non-target catch and discards (#23) are estimated from volunteered data during angler surveys.

The Comparative Analysis document focused on federal fisheries. However, the Regional Fisheries Commissions (Atlantic States Marine Fisheries Commission, Gulf States Marine Fisheries Commission, and Pacific States Marine Fisheries Commission) are state-federal compacts and should be considered for this document to be thorough. They operate under federal laws and have cooperative management with the federal government. Their FMPs reflect the same concerns as the RFMC FMPs, and they face similar issues of management and enforcement.

The Comparative Analysis document does recognize some of the NRC review of fisheries issues, but the list was not complete. NRC reviews provide a high level of competent *Independent Evidence*. I have included 16 NRC reports to my table of topics. There are several more, but they are more specific to an area or to a species.

Academic scientists have actively researched topics in climate change effects on fisheries, essential fish habitat, and fish productivity. I have added some of these references to the *Independence Evidence* section of the topics.

My assessment of these topics is listed in table 1.

ToR 2 – Rate U.S. federal fishery management via the symbol system described in Framework Assessment of Sustainability.

For each of the three components (*Internal, Outcome, and Independent*) of the 24 topics of pertinence, I have evaluated the evidence and assigned symbols to each. I mostly agreed with the symbols in the Comparative Analysis document with a few exceptions as noted above. I agreed fully with most of 24 topics of pertinence, disagreed in 2 of 3 components with 2 out of 24 topics and only one component in 8 out of 24.

My symbol assignments for the three components of the 24 topics are in table 1.

ToR 3 - Provide future considerations on how the U.S. federal marine fishery management system may mitigate gaps or weaknesses in conformance (as per the reviewer's rating).

Topic of Pertinence #4 Ecosystem effects of fishing are assessed and adverse effects addressed – This was graded lower than the document because there are still too few regulations that explicitly frame the legal consequences for habitat destruction. Moreover, it is difficult at times to separate more subtle fisheries-influence habitat destruction form environmental changes to the ecosystem.

Topic of Pertinence #5 Types and scales of fisheries considered in management – This was graded higher because there is good feedback to management through the federal court system.

Topic of Pertinence #6 Adequate/reliable data are collected, maintained and assessed - This was graded higher because there is more review available through high-quality studies and peer-review.

Topic of Pertinence #7 Traditional, fisher or community knowledge considered – The Independent component was graded lower because there are still barriers for artisanal and Native American fishers to share their knowledge and experience. Although NMFS has developed more outreach to native communities, more is needed to encourage trust and participation.

Topic of Pertinence #15 Goal of long-term sustainability present - The Independent component was graded lower because there has been less progress than needed in understanding how climate change will effect distributions and productivity, thereby compromising long-term sustainability.

Topic of Pertinence #18 Stock is not overfished - The Internal component was graded higher because there are clear legal guidelines to regulate overfishing and to specify when overfishing is occurring in most stocks. There has been good progress recently in evaluating overfishing in data-poor stocks.

Topic of Pertinence #19 Long-term changes in productivity considered - The Internal component was graded lower because there have not been laws or regulations that adequately handle the effects of ocean acidification and climate change on fisheries. Understandably, it has been difficult to do so in today's political climate.

Topic of Pertinence #21 Stock structure contributing to resilience considered - The Independent component was graded lower because there has been too little attention and research on the changes in stock structure and distribution due to changing climate and ocean conditions.

Topic of Pertinence #24 Knowledge of the essential habitats for managed stocks - The Outcome and Independent components were graded lower because the value of Marine Protected Areas (MPAs), while a valuable tool of management, may not be effective as ocean conditions change but they are placed in specific locations that are not dynamically responsive. In certain habitats, MPAs should work well, but they are not a full answer to protecting habitat. Similarly, the effects of ocean acidification may change fish use of habitats and this should be anticipated with responsive regulations.

ToR 4. Compile ratings for all 25 Topics of Pertinence into one summary sheet (as described by Table 1 template in Framework Assessment of Sustainability).

My assessment of the Framework Assessment of Sustainability summary table largely agrees with the summary table in the Comparative Analysis document. My experience with fisheries leaves me less positive about a few topics, such as topic # 19, long-term changes in productivity considered. The analysis by NOAA does a good job of covering the challenges of climate change and ocean acidity. However, I don't agree that the U.S. has developed explicit legislation to address these challenges, has implemented plans and regulations, or has developed a sufficient dialog with the public to adequately portray the consequences on fish abundance and distribution.

ToR 5 - After completing the conformance assessment of the U.S. federal marine fishery management system, provide suggestions on refining the methodological processes described in Framework Assessment of Sustainability.

I found the documents to be thorough and well-thought through. I did have a problem following the Conformance Evidence because it was interspersed with differing combinations of Conformance and Gaps Summaries. Also the Comparative Analysis document is less clear about the major framework of the FAO Guidelines throughout the text, although the FAO guideline reference numbers do appear on page 253 in the summary table. It wasn't as clear to me how directly comparable these were and a table that directly showed the text of the FAO guidelines versus the Topic of Pertinence would make this clearer.

The Topics of Pertinence seemed in a few instances to be a bit redundant and should be better delineated. For several, the impacts of climate change become somewhat redundant. I did find the Topics presentation more concise and to the point than the FAO Guidelines. In building the components of evidence, sometimes it was less clear to me what serves as a good example of Outcome and Independent Evidence and that might be further clarified.

Table 1. CIE Review Conformance Summary

Type of Evidence	Internal	Outcome	Independent
Symbol Rating	●	●	●
Description	• MSA: "REQUIRED PROVISIONS. Any fishery management plan...shall (be) ...consistent with the national standards, the other provisions of this Act, regulations implementing recommendations by international organizations ...and any other applicable law"; • ESA: "The (U.S.) has pledged itself as a sovereign state in the international community... pursuant to...international agreements." NEPA? ESA? MMPA?	• Fishery management plans (FMPs) for individual species and complexes by the 8 regional fishery management councils (RFMC) • Regional Fisheries commissions (RFC) such as Atlantic States Marine Fisheries Commission (ASFMC) manage inshore, cross-jurisdictional fisheries with FMPs • US participation in international fisheries organizations – NAFO, ICCAT • US leadership on ICES committees • International collaboration for management of trans-boundary stocks, e.g. Canada-US bilateral fisheries management of Gulf of Maine TRAC; 1985 Pacific Salmon Treaty	•NMFS has routinely had over 100 open lawsuits to challenge management implementation by commercial, public and NGO interests •US fisheries policy implementation has been challenged in international courts

Topic of Pertinence #2 There are documented management approaches for the "stock under consideration"

Type of Evidence	Internal	Outcome	Independent
Symbol Rating	●	●	●
Description	• MSA: "Each Council shall...for each fishery under its authority that	• Each RFMC develops a FMP specific to its stocks that incorporate level of	• FMPs are available for public review on RFMC websites.

	requires conservation and management, prepare and submit ... a fishery management plan"; • ESA: "...develop and implement...'recovery plans'... for the conservation and survival of endangered...and threatened species..."	uncertainty, often through a tier system that provides a buffer based on the data available for the stock. •RFMC develop rebuilding plans for subject stocks when assessments indicate that the stock is overfished. •Regional commissions develop FMPs that incorporate levels of uncertainty, e.g. ASMFC Amendment 2 to the Interstate Fishery Management Plan for Atlantic Menhaden, which is overfished, includes a recovery plan.	•RMF Council and SSC meetings are open to the public. •FMPs for the regional commissions are available for public review on their websites. •FMP are available for public review on state agency websites.

Topic of Pertinence #3 Uncertainty taken into account via risk assessment or precautionary approach			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches." • NS1 Guidelines: "...take an approach that considers uncertainty in scientific information and management control of the fishery" • NS6 Guidelines: "Allowances for uncertainties should be	•Stock assessments are provided to the scientific and statistics committees (SSC) of the RFMC •RFMC technical committees develop stock assessments and, depending on quality of available data, provide a buffer for uncertainty, e.g. ASMFC Amendment 2 to the Interstate Fishery Management Plan for Atlantic Menhaden includes buffers for uncertainty p47-49.	•SSCs include uncertainty buffers based on the data available for stock assessment when setting annual catch limits (ACL), e.g. Tier structure for the PMFC where "SSC determines the sigma, which varies by the category of stock (stocks are categorized by the level of uncertainty in determining the OFL; higher sigmas are specified for stocks with greater

	factored into the various elements of an (Fishery Management Plan)." • NS9 Guidelines: "Councils should adhere to the precautionary approach ... when faced with uncertainty..." • MMPA: "... an estimate of the number of animals in a stock ... is based on the best available scientific information on abundance, incorporating the precision and variability associated with such information;"		uncertainty." – Sigma translates to a percentage multiplier of the overfishing limit (OFL). •Benchmark stock assessments undergo rigorous peer review through the Center for Independent Experts (CIE). These reviews are open to public scrutiny on the CIE website. •NMFS and academic institutions continue to develop new methods to evaluate stock status and uncertainty

Topic of Pertinence #4 Ecosystem effects of fishing are assessed and adverse effects addressed			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	◒	◒
Description	• MSA: "...minimize to the extent practicable adverse effects on such habitat caused by fishing..." • NS1 Guidelines: "Factors to consider in (Optimum Yield) specification...include impacts on ecosystem component species, forage fish stocks, other fisheries, predator-prey or competitive interactions, marine mammals, threatened or	• Environmental impact statements and environmental assessments mandated by NEPA. • RFMC SSCs have developed Fisheries ecosystem plans (FEP), e.g. http://www.safmc.net/ecosystem management/fishery-ecosystem-plan-1. •State agencies and RFC have developed FEP, e.g. for the Chesapeake Bay see http://www.dnr.state.md.us/irc/docs/00009489.pdf	• Review of the impact of fishing on habitat by the National Research Council. NRC 2002b. • FEP available on RFMC websites for public review. •Stage agency and RFC plans are available for public review. •Governmental agencies apart from

	endangered species, and birds." • MMPA: "If... the level of incidental mortality or serious injury from commercial fisheries ... is likely to result in an impact that is more than negligible on the endangered or threatened species or stock, the Secretary shall use the emergency authority...title to protect such species or stock..." • ESA: "... if an endangered species or threatened species of a marine mammal is involved ... the Secretary shall provide ... a written statement that— (i) specifies the impact of such incidental taking on the species, (ii) specifies those reasonable and prudent measures that the Secretary considers necessary or appropriate to minimize such impact..."; "...the applicant therefor submits to the Secretary a conservation plan that specifies— (i) the impact which will likely result from such taking; (ii) what steps the applicant will take to minimize and mitigate such impacts..." • NEPA: "...include in every recommendation or report on proposals for legislation and other major Federal actions... (i) the environmental		NMFS have evaluated habitat and ecosystem effects. See Maryland Sea Grant ecosystem planning. http://www.mdsg.umd.edu/topics/ecosystem-based-fisheries-management/ecosystem-based-fisheries-management. •Specific reviews of ecosystem concerns such as preservation of the forage base have been developed by NGOs, e.g. http://www.oceanconservationscience.org/foragefish/task/index.html. •Including ecosystem metrics into stock assessment evaluations still remains problematic. It is difficult to develop quantitative measure for complex ecosystems.

	impact of the proposed action, (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented ..."		

Topic of Pertinence #5 Types and scales of fisheries considered in management			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	◒	●
Description	• MSA: "Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches." •NS6 Guidelines: "Each fishery exhibits unique uncertainties. The phrase 'conservation and management' implies the wise use of fishery resources through a management regime that includes some protection against these uncertainties. The particular regime chosen must be flexible enough to allow timely response to resource, industry, and other national and regional needs. Continual data acquisition and analysis will help the development of management measures to compensate for variations and to reduce the need for substantial	•FMP include accommodation to large and small-scale fisheries •Needs of recreational fishery can be different than commercial sector analyses ıcil Advisory Committees have representative from large and small-scale fisheries • "50-75 nautical mile longline fishing exclusion areas have been established around the main Hawaiian Islands to protect the interests of small- scale troll and handline fishermen" (Bartram et al., 2008 citing the Pelagic Fisheries of the Western Pacific Region fishery management plan – Amendment 5 – 1991). • "Large vessel closed areas protect the interests of small- scale fishermen in American Samoa. Vessels	• "US fisheries management plans provide for stakeholders' participation in determining management decisions and address the interests of small-scale fishers. Regional Fishery Management Councils do include small-scale fisheries groups"; "...institutional structures for ongoing consultation...small-scale fisher's opinions are...included in plans." [Score 8 out of 10 (Pitcher et al., 2006; Vasconcellos et al., 2006)]. •Studies have addressed the difficulties in accruing fair distribution of catch shares to large- and small-scale fisheries and individuals. See Macinko and

	buffers. Flexibility in the management regime and the regulatory process will aid in responding to contingencies." • RFA: "...the agency shall prepare and make available for public comment an initial regulatory flexibility analysis. Such analysis shall describe the impact of the proposed rule on small entities"; "Each final regulatory flexibility analysis shall contain...a description of the steps the agency has taken to minimize the significant economic impact on small entities..."	longer than 50 ft. are prohibited from fishing for pelagic fish in specific areas around Tutuila, Manu`a Islands, Rose Atoll and Swains Island to prevent gear conflict between different sized vessels" (Bartram and Kaneko, 2009 citing regulations for large vessel closed areas in nearshore waters around American Samoa, revised March 15, 2002.). • Community Development Quota programs (e.g., Western Alaska) •IFQ and ITQ programs tend to result in a consolidation of catch shares by few individuals and may accrue the bounty of the public trust to individuals.	Bromley 2002. Who owns America's fisheries. •Lawsuits in federal and state courts to change allocation between recreational and commercial fisheries. See http://gulfseafoodnews.com/2014/03/27/federal-ruling-on-allocation-favors-gulf-commercial-red-snapper-fishermen/

Topic of Pertinence #6 Adequate/reliable data are collected, maintained and assessed			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	•MSA: "REQUIRED PROVISIONS.—Any fishery management plan...shall... specify the pertinent data...with respect to commercial, recreational, charter fishing, and fish	• Fishery management plans include the most recent catch and discard data available. • Upon vetting and peer-review new biological	• Reviews of stock assessments by the CIE are available online and RFMC SSC meetings are open to the public.

	processing in the fishery..." • NS2 Guidelines: "Successful fishery management depends, in part, on the timely availability, quality, and quantity of scientific information"; An (Fishery Management Plan) should identify scientific information needed from other sources to improve understanding and management of the resource, marine ecosystem, and the fishery (including fishing communities)." • ESA: "The Secretary shall make determinations...solely on the basis of the best scientific and commercial data available to him after conducting a review of the status of the species..."	information on a stock is incorporated into the FMP of RFMC, RFC, and state FMPs. • Benchmark stock assessments are undertaken every 3-5 years or so and contain the latest data available. Update assessments are done in other years and contain the latest catch and discard data pertinent to the assessment. • The National Vessel Monitoring System requires commercial vessels to operate transponders that record the vessel location for spatial effort analyses. • Logbooks are used as data sources • Observers are used to validate commercial harvests. • NMFS collects recreational fisheries effort, catch and discard data through the Marine Recreational Information Participation (MRIP) program • For some fisheries the collection of adequate data is not feasible given constraints due to the size or scale of the fishery. Thus, the degree to which adequate data are available varies.	• In the review of stock assessments, Councils' SSC members and public comment on whether or not they feel adequate data has been collected and considered for a stock. • Data on commercial and recreational catch, effort and discards are collected annually through surveys that have been peer-reviewed. See NRC 2000. • Recreational survey methodology for data collections have been peer-reviewed. See NRC 2006a. •RMCs collect and analyze biotic data such as age, and catch, effort and discard data on species under their jurisdiction through programs such as ACCSP, http://www.accsp.org. •"Are timely and reliable statistics available on catch and fishing effort maintained ...in sufficient detail to allow sound statistical analysis? Yes. [Bartram et al., 2008 (Hawaii pelagic longline fisheries); Bartram and Kaneko, 2009 (American Samoa longline fisheries)].

Topic of Pertinence #7 Traditional, fisher or community knowledge considered			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	◒
Description	• MSA: "VOTING MEMBERS.—" ...individuals who, by reason of their occupational or other experience, scientific expertise, or training, are knowledgeable regarding the conservation and management, or the commercial or recreational harvest, of the fishery resources of the geographical area concerned." • Executive Order 13175: "Each agency shall have an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications."	• Council members, committees, and advisory panels are composed of people from each sector. • Public comment sessions at Council meetings • Northeast oral history project • Local Fisheries Knowledge Project • Economic and Social Sciences Research Program at the Alaska Fisheries Science Center	•Councils meet publicly, and meetings are open for public participation. •The NRC has reviewed national fisheries programs to better integrate traditional knowledge in fisheries decisions, See NRC 2005, 1999c.

Topic of Pertinence #8 Best scientific evidence used in management measures			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "Conservation and management	• Fishery management	• Stock assessments for NOAA managed

	measures shall be based upon the best scientific information available." • NS2 Guidelines: "(Fishery Management Plans) must demonstrate that the best scientific information available was used..." • ESA: "BASIS FOR DETERMINATIONS—The Secretary shall make determinations...solely on the basis of the best scientific and commercial data available..."; "The Secretary shall designate critical habitat...on the basis of the best scientific data available..."	plans • Stock assessments are updated using the most advanced models and statistical techniques. • RFMC SSCs publically declare that they have considered the best scientific information available in their stock assessments.	fisheries are reviewed by regional panels of independent experts (e.g., SARC, SEDAR, etc.), and then by a Council's Science and Statistical Committee. • Benchmark stock assessments undergo independent peer review through the CIE. • Data-poor models that have been developed by NMFS and academics have undergone rigorous CIE review and these reviews are publically available.

Topic of Pertinence #9 Total fishing mortality from all sources considered for the managed stock under consideration			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	•MSA: "Any fishery management plan...may establish...measures to incorporate bycatch into quotas..." • NS1 Guidelines: "Definitions. Catch is the total quantity of fish..." • NS9 Guidelines: "... evaluate total fishing mortality..."	• Stock assessments, which include estimates of total fishing mortality. • Observers report commercial fishery discards. • MRIP reports recreational fishery releases.	• CIE reviews the measures of fishing mortality (F) in stock assessments of NOAA managed fisheries (e.g., SARC, SEDAR, etc.). • Before setting ACL Council SSCs review F and its position relative to maximum allowable F that delimits overfishing. • Total and complete removals from entire stock areas over the whole life cycle were

			accounted for in stock assessments [Score 8 out of 10 (Vasconcellos et al., 2006)].

Topic of Pertinence #10 Maximum sustainable yield or proxy used for management target			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "REQUIRED PROVISIONS.—Any fishery management plan...shall... assess and specify ...maximum sustainable yield..."; "Each scientific and statistical committee shall provide its Council ongoing scientific advice for fishery management decisions, including recommendations for ...maximum sustainable yield..." • MMPA: "The term 'potential biological removal level' means the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock ..."	•Stock assessments are performed using the most appropriate model determined by the quality of the available data. MSY is determined directly in analytic models, proxies such as spawning potential ratio (SPR) are used for others, and a specified level of catch as a proxy in data-poor fisheries. •FMPs indicate the level of MSY or proxy value.	•Review of benchmark assessments by the CIE and SSCs and SSC review of assessment updates evaluate MSY and its proxies and biological reference points •Assessment reviews are open to the public •Once approved by the Secretary of Commerce, fishery management plans, plan amendments, and framework actions are considered public policy; so any management measure within the management plan is subject to public comment procedures before decision making as called for by the Administrative Procedures Act. Thus, the public itself can independently review and provide comments to Councils regarding maximum sustainable yield specifications in fishery management plans before approval by the Secretary of

			Commerce.

Topic of Pertinence #11 Optimal utilization is promoted in management			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	•MSA: "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the U.S. fishing industry."	•FMP include consideration of biological, social and economic factors in evaluating potential fishery yields. •IFQs provide a mechanism to optimize economic value of a fishery	• The assessment and specification of optimum yield is included in some regional stock assessments (e.g., SEDAR), of which benchmark assessments are reviewed by the Center for Independent Experts. • RFMC use advisory sub-committees to review allocations and efficiencies •Recreational fisheries interests challenge the value of commercial fisheries, thus solving conflict politically and perhaps not optimally

Topic of Pertinence #12 Food-web ecosystem considerations considered			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	◒	◒	◒
Description	• NS1 Guidelines: "Councils must also describe fisheries data for the...ecosystem component species in	• RFMC SSCs have developed Fishery ecosystem plans that are in various stages of implementation. See	• Ecosystem plan development has been an active area of development for NGOs. See

	their (Fishery Management Plans)..."; "The benefits of protection afforded to marine ecosystems are those resulting from...maintaining adequate forage for all components of the ecosystem ..."; "Factors to consider in (Optimum Yield) specification ...Examples include impacts on ecosystem component species, forage fish stocks, other fisheries, predator-prey or competitive interactions..." • CFR 50-VI-600.815: "Ecological relationships among species and between the species and their habitat require, where possible, that an ecosystem approach be used in determining the (Essential Fish Habitat) of a managed species"; "(Fishery Management Plans) should list the major prey species for the species in the fishery management unit and discuss the location of prey species' habitat." • ESA: "The Secretary shall... determine whether any species is an endangered species or a threatened species because of... predation..."; "The Secretary shall make	http://www.mafmc.org/eafm/ •RFC have developed ecosystem and habitat components of their FMPs for fisheries under their jurisdictions. See http://www.asmfc.org/habitat/program-overview. • Pacific Council's Coastal Pelagic Species fishery management plan prohibits krill (a forage species) harvest • North Pacific Council amended the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish management plans preclude directed fishing on over 20 important forage species • In annual Stock Assessment and Fishery Evaluation Reports, the North Pacific Council's Groundfish Plan Teams prepare separate Ecosystem Considerations sections, which include descriptors of forage fish •Fishery closure areas around some rookies to protect Steller sea lion foraging areas in the Bering Sea/Aleutian Islands •NOAA's Pacific Fisheries Science Center, Fishery Science Center, Fishery Biology and Stock Assessment Division,	http://www.oceanconservationscience.org/forage fish/. • The NRC has undertaken several reviews of ecosystem considerations of fisheries management. NRC 2006, 2003, 2002, 1999. • Ecosystem linkages with fishery are made explicit in management plans [Score 8 out of 10 (Vasconcellos et al., 2006)]. • The United States exhibited a 'good' performance rating for publishing principles, establishing indicators, and implementing ecosystem-based management and scored highest of 33 countries regarding setting ecosystem-based management principles (Pitcher et al., 2009). • A World Wildlife Fund independent review acknowledged that ecosystem- based management science, policy, and data are being developed in the U.S. for marine capture fisheries (Grieve and Short, 2007).

	determinations...to protect such species, whether by predator control, protection of ...food supply..." • This is an instance of considerations being ahead of the science to quantify ecosystem linkages and effects in a manner that can be promulgated into law that isn't vague in its implementation	conducts diet and food web modeling for a variety of federally managed	

Topic of Pertinence #13 Management should specify limits or directions in key performance indicators, e.g. overfishing			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "...Each Council shall...develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee or the peer review process..."; REQUIRED PROVISIONS.—Any fishery management...shall—...establish a mechanism for specifying annual catch limits... or annual specifications, at a level such that overfishing does not occur in the fishery..."; "Each scientific and statistical committee	•FMP for species managed by the RFMC and RFC specific stock status and limit reference points. •Fishery recovery plans are mandated to reach MSST within a specified time period. •Fish Stock Sustainability Index • Status of Stocks Report (to Congress)	•The NRC has reviewed fishery recovery plans. NRC 2014. •Limit reference points are reviewed in stock assessment by CIE •Independent academic review of reference points. See Botsford et al. 2004. •NMFS internal reviews of reference points. https://www.st.nmfs.noaa.gov/Assets/stock/documents/workshops/nsaw_5/gabriel_.pdf

	shall provide its Council ongoing scientific advice for fishery management decisions, including recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, and achieving rebuilding targets..."; • NS1 Guidelines: "Status determination criteria (SDC) mean the quantifiable factors, MFMT (Maximum Fishing Mortality Threshold), OFL (Over Fishing Limit), and MSST (Minimum Stock Size Threshold), or their proxies, that are used to determine if overfishing has occurred, or if the stock or stock complex is overfished." • MMPA: "The term 'potential biological removal level' means the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population" • ESA: "... The Secretary shall develop and		

	implement (recovery) plans... and...incorporate in each plan— ...measurable criteria which, when met, would result in a determination...that the species be removed from the list..."		

Topic of Pertinence #14 Actions taken if limits approached or exceeded			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "REQUIRED PROVISIONS.— Any fishery management plan...shall... establish a mechanism for specifying annual catch limits in the plan...including measures to ensure accountability." • NS1 Guidelines: "...if an (Annual Catch Limit) is exceeded for a year, then (Accountability Measures) are triggered for the next year...";"(Accountability Measures) are management controls to prevent (Annual Catch Limits)...from being exceeded, and to correct or mitigate overages of the (Annual Catch Limits) if they occur"; • MMPA: "If...the level of incidental mortality or serious injury from commercial fisheries...is	•Accountability measures in FMPs of fisheries managed by RFMC and RFC. •NMFS rebuilding schedules and plans for overfished stocks • Take reduction plans for marine mammals • List of Fisheries categorization and mitigation measures for incidental mortality and serious injury to marine mammals occurring in each fishery • Recovery plans for threatened or endangered species	•States that exceed catch limits in stocks managed by RFC can be declared out of compliance and their fisheries shut down. •The NRC has reviewed fishery recovery plans. NRC 2014. •NGOs have brought suit in federal courts to hasten rebuilding plans, while commercial fisheries have sued to slow rebuilding. See http://www.mass.gov/ago/news-and-updates/press-releases/2013/2013-05-30-noaa-lawsuit.html and http://www.oceanconservancy.org/who-we-are/newsroom/2012/imperiled-south-atlantic-fish.html. •Rebuilding plans are

	likely to result in an impact that is more than negligible on the endangered or threatened species or stock, the Secretary shall use the emergency authority to protect such species or stock..." • ESA: "PROTECTIVE REGULATIONS.—Whenever any species is listed as a threatened species pursuant to subsection (c) of this section, the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species. The Secretary may by regulation prohibit with respect to any threatened species any act..."		available on RFMC and RFC websites for public review

Topic of Pertinence #15 Goal of long-term sustainability present			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	◒
Description	• MSA: "DEFINITIONS.—... "conservation and management" refers to all of the rules, regulations, conditions, methods, and other measures... to assure that...there will be ... options available with respect to future uses of the resources"; "Conservation and management measures	•FMPs establish MSY as the OFL and have precautionary buffers to maintain stocks at long-term sustainable biomass. •FEPs establish biocomplexity as a long-term goal to maintain sustainable fisheries. •Laws prohibit the taking	•Academic evaluation of requirements for long-term sustainability relies on maintaining biocomplexity of ecosystems. See Hilborn et al 2003. •NGOs publicize issues of fisheries sustainability. See http://www.oceancons

	shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery"; "REQUIRED PROVISIONS.— Any fishery management plan... shall... contain the conservation and management measures... necessary...to... promote the long-term health and stability of the fishery;" • NS1 Guidelines: "To the extent possible, the relevant social, economic, and ecological factors used to establish (Optimum Yield) for a stock, stock complex, or fishery should be quantified and reviewed in historical, short-term, and long- term contexts." • MMPA: "The long-term goal of the (take reduction) plan shall be to reduce, within 5 years of its implementation, the incidental mortality or serious injury of marine mammals incidentally taken in the course of commercial fishing operations to insignificant levels" • ESA: "The Secretary ... shall ... incorporate in each (recovery) plan ... a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species;"	of marine mammals and other protected species as bycatch in fisheries.	ervancy.org/our-work/fisheries/. •Environmental Defense Fund develops toolkit to encourage sustainable fisheries in 2013. fisherytoolkit.edf.org •Monterey Bay Aquarium publishes guides to sustainable fisheries food choices

	• NEPA: "...include in every recommendation or report on proposals for legislation and other major Federal actions ... the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity...".		

Topic of Pertinence #16 Framework for fisheries at local, national or regional level			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "...There shall be established... Regional Fishery Management Councils...Each Council shall reflect the expertise and interest of the several constituent States in the ocean area over which such Council is granted authority" • MMPA: "...for a strategic stock ... the Secretary may ... establish a take reduction team ... Members shall include representatives of Federal agencies, each coastal State which has fisheries which interact with the species or stock, (etc.)..." •Compacts of the RFC establish cross jurisdictional cooperation among the	•The 8 RFMC are responsible for fisheries within the Exclusive Economic Zone of the US. •The 3 RFC share responsibility across their member states and with the federal government for the management of stocks within state waters and stocks that cross to the EEZ. •Take reduction teams for marine mammals	•RFMC and RFC meetings are open to the public, public comment is permitted, agendas and meeting notes are available on the web.

	states and cooperation with the federal government in managing stocks under their purview..		

Topic of Pertinence #17 Compliance ensured via monitoring and enforcement			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	◒
Description	• MSA (and similar language in MMPA and ESA): "ENFORCEMENT. (a) RESPONSIBILITY.—The provisions of this Act shall be enforced by the Secretary and the Secretary of the department in which the Coast Guard is operating. Such Secretaries may...utilize the personnel, services, equipment (including aircraft and vessels), and facilities of any other Federal agency, including all elements of the Department of Defense, and of any State agency, in the performance of such duties" • NS1 Guidelines: "The Secretary has an obligation to implement and enforce the (Fishery Management Plan)." • CFR 15-IX-905.3: "Information collected by a voluntary fishery data collector...Is subject to discovery by any	• Coast Guard and NOAA Fisheries Office of Law Enforcement responsible for enforcing laws in EEZ. • State fisheries resources department law enforcement officers responsible for enforcing laws within state waters. • Recreational fisheries are less highly enforced due to numerous access points to fisheries. • Observers and at-sea monitors • Logbooks, vessel trip reports, catch reports, permits, and trip tickets • Vessel monitoring systems	• U.S. federal marine fisheries management has a fairly effective catch inspection scheme [Score 7 out of 10 (Vasconcellos et al., 2006)]. •There is less vigorous enforcement of recreational fisheries because of numbers of anglers participating, angler survey participation discretionary, and bag limits are shared among the party.

	party to an enforcement proceeding..." • CFR 50-II-216.8: "Enforcement Agents of the National Marine Fisheries Service shall enforce the provisions of the MMPA and may take any actions authorized by the MMPA with respect to enforcement."		

Topic of Pertinence #18 Stock is not overfished			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	◒	◒
Description	• NS Guidelines: "To avoid confusion, this section clarifies that "overfished" relates to biomass of a stock or stock complex, and "overfishing" pertains to a rate or level of removal of fish from a stock or stock complex"; "A stock or stock complex is considered "overfished" when its biomass has declined below a level that jeopardizes the capacity of the stock or stock complex to produce (Maximum Sustainable Yield) on a continuing basis." • ESA: "The Secretary shall... determine whether any species is an endangered species or a threatened species because of... overutilization for commercial, recreational, scientific, or educational	•FMPs contain metrics to assess that stocks are overfished and when declared overfished then strict limits are placed on fishing •By 2013 few US stocks were overfished among those that had stock assessments.	•Academic analysis of the effects of overfishing. See Shekker et al 2005. •Public awareness of effects of overfishing raised by NGOs. See http://www.worldwildlife.org/threats/overfishing. •NGOs bring lawsuits to decrease overfishing. •Little public attention directed to effects of land-use practices on fish habitat destruction or effects of climate change on fish productivity.

	purposes;"		

Topic of Pertinence #19 Long-term changes in productivity considered

Type of Evidence	Internal	Outcome	Independent
Symbol Rating	◒	◒	◒
Description	• The MSA is the closest document to consider long-term changes in productivity but it is not directly stated •MSA: "For a fishery that is overfished, any fishery management plan, amendment, or proposed regulations for such fishery shall—...specify a time period for rebuilding the fishery that shall—...not exceed 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures ... dictate otherwise;"	•There are rebuilding plans in FMPs • Fisheries and the Environment (FATE) program	•SSCs have challenges evaluating if declines in abundance are due to climate change •There is much academic interest in climate effects on fish abundance and distribution. This provides foundation for management decisions. See Morgan et al. 2014. •The effects of ocean acidification is an active area of research. See Frommel et al 2014.

Topic of Pertinence #20 Restoration of stocks required within reasonable timeframes

Type of Evidence	Internal	Outcome	Independent
Symbol Rating	●	●	●
Description	• MSA: "The term "conservation and management" refers to all of the rules, regulations, conditions, methods, and other measures... to rebuild,	• Rebuilding plans are included in FMP and amendments to RFC plans • Recovery plans for	•The NRC has published a recent review of fishery rebuilding plans. NRC 2014. • Rebuilding plans challenged in US courts

	restore, or maintain... any fishery resource and the marine environment"; "For a fishery that is overfished, any fishery management plan, amendment, or proposed regulations... shall— ...specify a time period for rebuilding the fishery that shall—...be as short as possible...(but) not exceed 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures... dictate otherwise;" • MMPA: "... the plan shall include measures the Secretary expects will reduce, within 6 months of the plan's implementation, such mortality and serious injury to a level below the potential biological removal level." • ESA: "The Secretary shall develop and implement (recovery) plans... for the conservation and survival of endangered species and threatened species listed...(and) incorporate in each plan—... estimates of the time required and the cost to carry out those measures..."	ESA-listed species • Take reduction plans for marine mammals • Full moratoriums on catch for some stocks managed by RFMC and RFC, e.g. striped bass moratorium in Chesapeake Bay	by commercial fishing • Rebuilding plans challenged in US courts by NGOs. See http://www.pewtrusts.org/en/about/news-room/news/2013/09/11/the-bottom-line-rebuilding-plans-work-for-us-fisheries • Recovery plans are open to public scrutiny on NMFS websites and through public hearings

Topic of Pertinence #21 Stock structure contributing to resilience considered

Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	◒
Description	• NS2 Guidelines: "The (Stock Assessment and Fishery Evaluation) report provides information to the Councils for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs."	•RFMC and RFC FMPs and stock assessments include information on stock structure and productivity	•The effect of climate change on species distributions is an active area of academic fisheries research. •Effectiveness of stock assessments in capturing species productivity has been subject to NRC review. NRC 1998.

Topic of Pertinence #22 Generic evidence based on similar stock situations			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	●
Description	• MSA: "To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination." • NS1 Guidelines: "An indicator stock is a stock with measurable status determination criteria that can be used to help manage and evaluate more poorly known	• RFMC and RFC FMPs provide justification for assigning a stock to a stock complex.	•The CIE reviews stock assessments and stock assessment models that are used for stock complexes. See recent CIE (2014) review of the use of Biomass augmented Catch-MSY model for the Pacific Island Coral Reef Ecosystem Resources. •RFMC SSC meetings are open to the public and assessments of species

	stocks that are in a stock complex. If an indicator stock is used to evaluate the status of a complex, it should be representative of the typical status of each stock within the complex, due to similarity in vulnerability.		complexes are open for public scrutiny •Species that are assigned to complexes can be data-poor and development of data-poor models is an active area of research for NMFS and academic scientists.

Topic of Pertinence #23 Non-target catch and discards not threatened by target fishery			
Type of Evidence	**Internal**	**Outcome**	**Independent**
Symbol Rating	●	●	◒
Description	• MSA: Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch"; "REQUIRED PROVISIONS.—Any fishery management plan...shall— ...establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery"; • NS9 Guidelines: "...determine the amount, type, disposition, and other characteristics of bycatch and bycatch mortality..."; "Other applicable laws, such as the MMPA, the ESA, and the Migratory Bird	• Reporting of bycatch is a legal responsibility of all commercial fishing license holders • Release of restricted, threatened or endangered species is a legal responsibility of all licensed recreational anglers. • Observers on commercial fishing vessels • Recreational angling surveys at access points. • Logbooks, vessel trip reports, catch reports and trip tickets • Dealer, landing, and production reports • Protected resource stranding and entanglement	• Recreational anglers are made aware of catch regulations with issuance of their licenses and through state and federal websites. • CIE reviews bycatch issues during stock assessments

	Treaty Act, require that Councils consider the impact of conservation and management measures on living marine resources other than fish; i.e., marine mammals and birds." • MMPA: "If...the level of incidental mortality or serious injury from commercial fisheries...is likely to result in an impact that is more than negligible on the endangered or threatened species or stock, the Secretary shall use the emergency authority...to protect such species or stock..." • ESA: "The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct"; "...with respect to any endangered species of fish or wildlife...it is unlawful...to... take any such species..." • Migratory Bird Treaty Act: "...it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, possess... any migratory bird..."	reports • Time and area closures in the EEZ and state waters • Catch share management • Gear and bait restrictions and modifications • U.S. National Bycatch Report • Bycatch Reduction Engineering Program	

Topic of Pertinence #24 Knowledge of the essential habitats for managed stocks

Type of Evidence	Internal	Outcome	Independent
Symbol Rating	●	◒	◒
Description	•MSA: "The term "essential fish habitat" means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity"; REQUIRED PROVISIONS.— Any fishery management... shall—...describe and identify essential fish habitat for the fishery"; " ...The Secretary shall... establish by regulation guidelines to assist the Councils in the description and identification of essential fish habitat in fishery management plans (including adverse impacts on such habitat)..." •CFR 50-VI-600.815: "(Fishery Management Plans) must describe and identify (Essential Fish Habitat) for each life stage of the managed species... should explain the physical, biological, and chemical characteristics ... (and) identify the specific geographic location or extent of habitats..." •ESA: "The term "critical habitat" for a threatened or endangered species means— ...the specific areas within the geographical area occupied by the species...on which are found those physical or biological features (I) essential to the	•Fish under management by RFMC and RFC have FMPs that explicitly state habitat for life stages.	•The NRC studies the effects of trawling on benthic habitats. NRC 2002b. •Marine Reserves are used to preserves fish habitat in state and federal waters. See http://www.dfg.ca.gov/marine/mpa/index.asp; NRC 2001. •Climate and essential habitat linkages is an area of active academic research. See Jones 2013.

	conservation of the species and (II) which may require special management considerations or protection"; "The Secretary... shall, concurrently with making a determination...that a species is an endangered species or a threatened species, designate any habitat of such species which is then considered to be critical habitat"		

Table 2. CIE Review Summary Table of Conformance

Conformance	Superscript #	Topic Description
●●●	1	Management system is in compliance with relevant local, national, and international laws
●●●	2	There are documented management approaches for the "stock under consideration"
●●●	3	Uncertainty taken into account via risk assessment or precautionary approach
●◒◒	4	Ecosystem effects of fishing are assessed and adverse effects addressed
●◒●	5	Types and scales of fisheries considered in management
●●●	6	Adequate/reliable data are collected, maintained and assessed
●●◒	7	Traditional, fisher or community knowledge considered
●●●	8	Best scientific evidence used in management measures
●●●	9	Total fishing mortality from all sources considered for the managed stock under consideration
●●●	10	Maximum sustainable yield or proxy used for management target
●●●	11	Optimal utilization is promoted in management
◒◒◒	12	Food-web ecosystem considerations considered
●●●	13	Management should specify limits or directions in key performance indicators, e.g. overfishing
●●●	14	Actions taken if limits approached or exceeded
●●◒	15	Goal of long-term sustainability present
●●●	16	Framework for fisheries at local, national or regional level
●●◒	17	Compliance ensured via monitoring and enforcement
●◒◒	18	Stock is not overfished

	19	Long-term changes in productivity considered
	20	Restoration of stocks required within reasonable timeframes
	21	Stock structure contributing to resilience considered
	22	Generic evidence based on similar stock situations
	23	Non-target catch and discards not threatened by target fishery
	24	Knowledge of the essential habitats for managed stocks

Appendix 1: Bibliography of materials provided by NMFS for review

Bibliography of materials provided for review

Comparative Analysis of U.S. Federal Fishery Management to the FAO Ecolabelling Guidelines: A Self-Assessment (~255 pp).

Framework Assessment of Sustainability: Methodology for Evaluating the Conformance of Fishery Management Systems to FAO's Guidelines for Ecolabelling (~35 pp

Bibliography of materials that I obtained for additional review

Botsford,.L.W., A. Campbell, and R. Miller Biological reference points in the management of North American sea urchin fisheries Can. J. Fish. Aquat. Sci. 61: 1325–1337 (2004)

Frommel, A.Y., R. Maneja, Rommel, D. Lowe, David, et al. 2014 Organ damage in Atlantic herring larvae as a result of ocean acidification ECOLOGICAL APPLICATIONS 24(5): 1131-1143.

Hilborn, R., T.P. Quinn, D.E. Schindler, and D.E. Rogers. 2003. Biocomplexity and fisheries sustainability. PNAS 100 (11): 6564-6568.

Jones, C.M. 2013. "Can we predict the future: juvenile finfish and their seagrass nurseries in Chesapeake Bay". ICES J. Mar. Sci. doi:10.1093/icesjms/fst142.

Mangel et al 2013 A perspective on steepness reference points and stock assessment CJFAS 70-6 p930-940.

Morgan, M. J., P.A. Shelton, R.M. Rideout, R. 2014. Varying components of productivity and their impact on fishing mortality reference points for Grand Bank Atlantic cod and American plaice. FISHERIES RESEARCH Volume: 155 Pages: 64-73.

NRC 2014. **Evaluating the Effectiveness of Fish Stock Rebuilding Plans in the United States** by Committee on Evaluating the Effectiveness of Stock Rebuilding Plans of the 2008 Fishery Conservation and Management Reauthorization Act, Ocean Studies Board, Division on Earth and Life Studies and National Research Council (Mar 19, 2014)

NRC 2006a. **Review of Recreational Fisheries Survey Methods** by Committee on the Review of Recreational Fisheries Survey Methods, Ocean Studies Board, Division on Earth and Life Studies and National Research Council (Jul 13, 2006)

NRC 2006b. **Dynamic Changes in Marine Ecosystems: Fishing, Food Webs, and Future Options** by Committee on Ecosystem Effects of Fishing: Phase II - Assessments of the Extent of Change and the Implications for Policy, Ocean Studies Board, Division on Earth and Life Studies and National Research Council (Jun 30, 2006)

NRC 2005. Developing a Research and Restoration Plan for Arctic-Yukon-Kuskokwim (Western Alaska) Salmon by Committee on Review of Arctic-Yukon-Kuskokwim (Western Alaska) Research and Restoration Plan for Salmon, Board on Environmental Studies and Toxicology, Polar Research Board, and National Research Council

NRC 2004 a. **Improving the Use of the "Best Scientific Information Available" Standard in Fisheries Management** by Committee on Defining the Best Scientific Information Available for Fisheries Management, Ocean Studies Board, Division on Earth and Life Studies and National Research Council (Sep 3, 2004)

NRC 2004b. **Cooperative Research in the National Marine Fisheries Service** by Committee on Cooperative Research in the National Marine Fisheries Service, Ocean Studies Board, Division on Earth and Life Studies and National Research Council (Jan 9, 2004)

NRC 2003. **The Decline of the Steller Sea Lion in Alaskan Waters: Untangling Food Webs and Fishing Nets** by Committee on the Alaska Groundfish Fishery and Steller Sea Lions, Ocean Studies Board, Polar Research Board and Division on Earth and Life Studies (Apr 3, 2003)

NRC 2002a. **Science and Its Role in the National Marine Fisheries Service** by Ocean Studies Board, Division on Earth and Life Studies and National Research Council (Jul 31, 2002)

NRC 2002b. **Effects of Trawling and Dredging on Seafloor Habitat** by Committee on Ecosystem Effects of Fishing and National Research Council (Jun 28, 2002)

NRC 2001. **Marine Protected Areas: Tools for Sustaining Ocean Ecosystems,** by Committee on the Evaluation, Design, and Monitoring of Marine Reserves and Protected Areas in the United States, by Ocean Studies Board and National Research Council

NRC 2000. **Improving the Collection, Management and Use of Marine Fisheries Data** by Ocean Studies Board and National Research Council (Jan 15, 2000)

NRC 1999a. **Sharing the Fish: Toward a National Policy on Individual Fishing Quotas** by Committee to Review Individual Fishing Quotas, Environment and Resources Commission on Geosciences, Division on Earth and Life Studies and National Research Council (Jun 9, 1999)

NRC 1999b. **Sustaining Marine Fisheries** by Committee on Ecosystem Management for Sustainable Marine Fisheries, Environment and Resources Commission on Geosciences, Ocean Studies Board and Division on Earth and Life Studies (Feb 19, 1999)

NRC 1999c. **The Community Development Quota Program in Alaska and Lessons for the Western Pacific** by Committee on the Community Development Quota Program, Ocean Studies Board and Commission of Geosciences, Environment and Resources, National Research Council

NRC 1998a.**Review of Northeast Fishery Stock Assessments** by Committee to Review Northeast Fishery Stock Assessments, Environment and Resources Commission on Geosciences, Ocean Studies Board and Division on Earth and Life Studies (Apr 14, 1998)

NRC 1998b.**Improving Fish Stock Assessments** by Committee on Fish Stock Assessment Methods, Environment and Resources Commission on Geosciences, Ocean Studies Board and Division on Earth and Life Studies (Mar 13, 1998).

Quinn II, T.J. and J.S. Collie 2004. Sustainability in single-species population models. Phil.Trans.R.Soc.B (2005)360,147–162

Pudden, E.J. and VanderZwaag, D.L. 2007 Canada–USA Bilateral Fisheries Management in the Gulf of Maine: Under the Radar Screen RECIEL 16 (1) 2007. ISSN 0962 8797

Rosenberg et al 2006 Rebuilding US fisheries Front_Ecol_Environ_4_6_303-308

Schekker, M., S. Carpenter, and B. de Young. 2005. Cascading effects of overfishing marine systems. TREE 20(11) :579-581.

Appendix 2: A copy of the CIE Statement of Work

Attachment A: Statement of Work for Dr. Cynthia Jones

External Independent Peer Review by the Center for Independent Experts

COMPARATIVE ANALYSIS OF U.S. FEDERAL FISHERY MANAGEMENT

TO THE FAO ECOLABELLING GUIDELINES

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description:

NMFS has developed a methodology to assess the sustainability of a fishery management system and has applied the methodology to U.S. federal marine fishery management. CIE reviewers would conduct an independent assessment of the U.S. federal marine fishery management system using the methodology provided. This assessment can act as a tool for NMFS to systematically document, communicate, and guide the sustainable management of U.S. federal fisheries. NMFS leadership believes that an independent assessment would be valuable for describing evidence of conformance between U.S. fishery intentions and performance, and the FAO Ecolabelling Guidelines. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application of fisheries management and/or stock assessment science, particularly with knowledge of the U.S. federal marine fishery management system (i.e., via NOAA and the Regional Fishery Management Councils) and associated legislation/regulation (i.e., the Magnuson–Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Endangered Species Act, etc.). Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review as a desk review, therefore no travel is required.

Statement of Tasks: Each CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, and other pertinent information. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read the following documents in preparation for the peer review.

1. *Framework Assessment of Sustainability: Methodology for Evaluating the Conformance of Fishery Management Systems to FAO's Guidelines for Ecolabelling* (~35 pp).
2. Examples of U.S. federal fishery management statutes and regulations relevant to addressing biological sustainability as outlined in the "Minimum Substantive Requirements" of the FAO's

Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries. (~70 pp).

Desk Review: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than REPORT SUBMISSION DATE, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Dr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Sampson, CIE Regional Coordinator, via email to *david.sampson@oregonstate.edu*. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

August 1, 2014	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
September 24, 2014	NMFS Project Contact sends the CIE Reviewers the report and background documents
September 24 – October 8, 2014	Each reviewer conducts an independent peer review as a desk review

September 8, 2014	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
October 17, 2014	CIE submits the CIE independent peer review reports to the COTR
October 24, 2014	The COTR distributes the final CIE reports to the NMFS Project Contact and the Office of Sustainable Fisheries

Modifications to the Statement of Work: This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work

Annex 2: Tentative Terms of Reference for the Peer Review

COMPARATIVE ANALYSIS OF U.S. FEDERAL FISHERY MANAGEMENT TO THE FAO ECOLABELLING GUIDELINES

Background

The National Oceanic and Atmospheric Administration (NOAA) Fisheries Service and many U.S. fishing industry groups believe that U.S. fisheries are sustainably managed under the strict mandates of the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, and the Endangered Species Act; however, U.S. consumers hear conflicting messages about the sustainability of U.S. seafood. This assessment will illustrate conformance between the NOAA Fisheries management system and internationally-accepted guidelines for sustainability adopted by the Food and Agriculture Organization of the United Nations (FAO).

The methodology, co-developed by NOAA Fisheries, is based on the 2010 FAO *Draft Evaluation Framework to Assess the Conformity of Public and Private Ecolabelling Schemes with the FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries*, which provides benchmarking indicators to validate fishery management systems' conformity with the 2009 United Nations FAO *Guidelines for Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries* (Ecolabelling Guidelines).

Objective

Conduct a conformance assessment of the U.S. federal marine fishery management system (i.e., via NOAA Fisheries and the Regional Fishery Management Councils) using the methodology described in *Framework Assessment of Sustainability: Methodology for Evaluating the Conformance of Fishery Management Systems to FAO's Guidelines for Ecolabelling*.

Outputs

To this end, CIE reviewers will apply the methodology described in *Framework Assessment of Sustainability: Methodology for Evaluating the Conformance of Fishery Management Systems to FAO's Guidelines for Ecolabelling* to assess conformance of the U.S. federal marine fishery management system to each of 25 Topics of Pertinence, i.e. -

For each Topic of Pertinence:

1. Generate a table (as described by Table 3 in *Framework Assessment of Sustainability*) documenting evidence of intention, performance, and independent verification of U.S. federal marine fishery management conformance.
    i. In assessing intentions (i.e., internal evidence), the document of example statutes and regulations provided (in the pre-review background documents) may serve as the basis for conformance evidence. Additional legislative and regulatory evidence may also be provided per the reviewer's knowledge and expertise.

ii. In assessing performance (i.e., outcome evidence) and independent verification (i.e., independent evidence), examples shall be derived from the reviewer's knowledge and expertise of the U.S. federal marine fishery management system.

2. Rate U.S. federal fishery management via the symbol system described in *Framework Assessment of Sustainability*.
3. Provide future considerations on how the U.S. federal marine fishery management system may mitigate gaps or weaknesses in conformance (as per the reviewer's rating).

Overall:

4. Compile ratings for all 25 Topics of Pertinence into one summary sheet (as described by Table 1 template in *Framework Assessment of Sustainability*).
5. After completing the conformance assessment of the U.S. federal marine fishery management system, provide suggestions on refining the methodological processes described in *Framework Assessment of Sustainability.*